

From Alchemy to Chemistry or Rasayana to Rasavada?

K.V. Ramakrishna Rao B.Sc., M.A., A.M.I.E., C.Eng.(I) B.L.,

Introduction: Scientific writers accept that Chemistry as a subject, in the modern connotation, developed only in the 17th century after Robert Boyle (1627-1691 CE)¹. The dubbing of medieval chemistry as alchemy or magic and the ancient chemistry as occultism, divination or sorcery without analyzing the prevailed subject matter supported by literary and archaeological evidence has led to the utter disregard of the valuable contribution of the ancients. Indian chemistry is plagued by the western spin, in spite of the attempts made by Prafulla Chandra Ray. While the significance of the ancient Indian chemistry designated as ritualism, magic and myth, the medieval chemistry is dishonoured as alchemy, the pseudoscience. Note the very medieval is used only to disparage the well-developed eastern natural philosophy compared to non-developed society.

To cite few examples, The Britannica Encyclopedia (1997)² describes as to how the “**alchemy degenerated in to a mass of superstition**,” and concludes with a sentence that: “**Alchemy in India eventually met with a similar fate.**” That is, alchemy of India is nothing but superstition. Even, “**the evidence from India is tenuous and from ancient China, Greece, and Islamic lands is only relatively more plentiful.**” Yet for such superstitious alchemy, the evidence from India is not enough to recognize it. To mystify further, it states that, “**The association of alchemy with religion was in later period until the rise of Tantrism (as esoteric, occultic, meditative system), AD 1100-1300.**” Here, the implication is that Tantrism i.e, the Tantric tradition developed only in the medieval period. The Encyclopedia Americana – International edition (1998) has been totally silent about it. All other reference books and works repeat the same story with variance in language. This is the situation now. Therefore, an attempt is made in this paper to investigate what exactly happened. Therefore, it is imperative to study the origin of the words – alchemy and chemistry.

¹ Carl Schorlemmer, Rise and Development of Organic Chemistry, p.9.

According Prof.Schorlemmer, "Upto the 16th century, almost the sole object of chemical research has been to find the philosopher's stone, but now chemistry began to develop itself into two new and different paths, opened by two distinguished men, Agricola, the father of metallurgy and Paracelsus, the founder of Latro-chemistry or medical chemistry. Both contributed chiefly to the development of inorganic chemistry....." He acknowledged the role of India in dyeing in the context of indigo.

² The New Encyclopaedia Britannica, 1997, USA, Vol.I, p.226; Vol.25, p.77-78.

The origin of word "Chemistry": The origin of word **alchemy** or **chemistry** has been in mystery through attempts have been made to derive it from the Egyptian **Chemnis** or **Chemi** by Edmund O. Von Lippmann or the Greek **chymeia** and **chemeia** proposed by Hermann Dieis and stressed by Julius Rusaka, **Chyma** means casting, thus **chymia** means the technique of casting metals added with the Arabic prefix, it was **called al-chymia** turning to **alchemy**. It is claimed by the western scholars that the word chemistry was first used by Zosimus from Panopolis (Chemnis) in Egypt in 3rd cent. BCE. They say **Chemi** is the old name of Egypt. Another interpretation is that it is derived from the Egyptian word **chame** or **kame** meaning black referring to the black soil of the Nile valley, thus, chemistry implies black art³. But, they are not unanimous in this regard.

The Sanskrit literature, **loha shastra** deals with metallurgy and **rasā sāstra** or rasavada serves with applied chemistry. Unlike other words, **rasa** has wide connotation of meanings covering all aspects of actions and reactions of chemistry and meaning remains the same even today. **Kama** (not kama, which is used in bad, vulgar and extreme sense. In fact, kama is derived from **kam**) means love, lust, attraction and its adjectives too have the same connotations. It can easily be noted that the Egyptian word **chame** or **kame** or **chemnis** or **chem**, the Greek **chymeia** or **chemeia** or Europeanized **chyma** or **chymia** match with the Sanskrit **Kama**. Thus the study of subject of attraction between elements can rightly be termed kama istry = kama + sastra = kamasastray = kamistry = chemistry. While the word chemistry has been of recent origin, the Sanskrit words have been in use more than 1200 to 1400 years exactly to denote the respective and specific branches.

Alchemy or chemistry dealing Mercury: The western and Muslim scholars have been assertive in defining Alchemy as the science of converting base elements to Gold or Silver with the aid of mercury. They stress the usage of mercury as the prime criterion in alchemy. They even contend that only Muslims introduced alchemy in India. Edmund O. Von Lippmann, a historian on chemistry and others held this view. Though S. Mahdihassan⁴ acknowledges that alchemy might have begun in 500 CE, he implies the Islamic influence relying upon M. Winternitze⁵.

"It is quite importance that Kautilya among different kinds of gold mentions artificial gold made from other metals by chemical process in which mercury is used. Now the use of mercury both in alchemy and in medicine is well known in India, but it is found only in later literature. Even P.C. Ray cannot trace it back to any further that the earlier tantric text in the 5 or 6th cent. A.D. In Medical works mercury is mentioned only once in Charaka's treatise, only in the Bower MS of cent. A.D and twice in Sushruta. It is

³ Georg Lockemann, **The Story of Chemistry**, Philosophical Library, USA, 1959, pp.30-31

⁴ S. Mahdihassan, **Indian Alchemy or Rasayana-In the light of asceticism and Geriatrics**, Department of History of Medicine, Institute of History of Medicine and Medical Research, Tughlaqabad, New Delhi-110062, 1977.

⁵ M. Winternitze, **Some Problems of Indian Literature**, Calcutta University Press, Calcutta, 1925

entirely unknown In earller literature. This chapter on mineral (must be) of later origin to the Arthasastra (as originally composed by Kautilya."

He argues that alchemy must have associated with mercury adding that if calcined metals were alchemical preparations, then, Indian alchemy is old. But, if alchemy is to be restricted to preparation of mercurials, then, it is later introduction from China. Thus, he concludes that alchemy in India might have begun in 500 CE and developed well in 1000 CE⁶.

Here, instead of analyzing the available evidence, the evidence itself is doubted for extraneous argument. The learned author knows very well that there are many words parada, parata, rasa, rasendra, suta, rasesa, capala, rasa raja etc to denote mercury in Sanskrit. Without mercury or usage of mercury, such words would not have been in use.

Parada: Derived from **par** i.e, totality of anything. Parara means Mercury, thus parada also connotes the same.

Parata: Same as above.

Rasa: Essence sum and substance of all elements. Interestingly, it has other meanings- semen virile, mercury, poison.

Rasendra: The head of essence i.e, the most important metal.

Suta: The ability to change i.e, transmute to gold.

Rasesa: Obtained or derived from and with the aid of mercury.

Capala: That has quick movement on account of its property of volatility. Perhaps, that is why in English, it is called quick silver.

Rasa raja: King of all metals i.e, capable of producing or transmuting other elements.

From this, it is evident that Tamil word padarasam might have been derived with parada or parata + rasa = paradarasa = padaradham = padarasam.

Word	Meaning	Work in which mentioned	date
Somarsa	Soma juice was used for immortality, Incidentally, its preparation is similar to that of Mercury	Rigveda Samhita. IX mandala deals with it.	4000-3000 BCE
Hiran	Gold confers long the on one who wears it	Atharvanaveda XIX.26; IV.10.1; IV.10.7; XIX.26.1-2.4	3000- 200 BCE
Hiran	Seed, longevity, immortality origin of everything and so on	Satapatha Brahmana the origin properties and other aspects of described extensively	1500 – 1000 BCE
Rasa	Essence, taste from to taste Mercury	Prasana Upanishad.4,8	

⁶ S. Mahdihassan, opt.cit.pp.50-51.

Parada	Mercury	Charaka Samhita	80-180 CE
Parada	Mentions about a mercuric cosmetic ointment which removes wrinkles, freckles, moles and acnes from face	Shushruta Samhita	3 rd to 4 th centuries
Suvama	Finely powdered and compounded used as restorative elixir	Shushruta Samhita	3 rd to 4 th centuries
	Preparation of artificial gold	Artasastra	4 th cent. BCE
	Preparation of artificial gold	Amarakosa	6 th cent. CE
		Siddhyoga by Vrinda	
	Various preparations of Mercury	Rasaratnakara by Nagarjuna	8 th cent. CE.
		Rasanava	1200 CE
		Rasaratna-samuccaya	1300 CE.
Parada	Quick silver	Bhaminivilasa 1.82	
Rasayana	Serving as an elixir that which gratifies or regales	Nikila-rsayana-mahito gandenogrena lashuna iva Rasayna Gangadhara.2	
Rasayana	Serving as an elixir	Manasakta rasayanani - Uttarama-charitra. 1.36	
Rasayana	Serving as an elixir that which gratifies or regales	Anandani hrudhayara-sayanani – Malati-madhava.6.8.	
Rasa /Rasayana	Mentions about loha suddhi – preparation of gold out of base metals	Rasa Hrudhaya tantra	9 th cent. CE

Thus, it is evident that the definite use of mercury with gold attained status in the third century BCE. Mercury occurs in Almaden (Spain), Idria (Italy), California, Mexico, Russia, Central China and Japan. The name is derived from the planet Mercury, implying that it runs quickly. Mercury was a Greek mythological character - a messenger, who could run fast. The preparation of Makara-Dhvaja has been characteristically mentioned by taking one part by weight of gold leaves titrated with eight parts of mercury to obtain a uniform paste. To this, 16 parts of Sulphur is added to form black sulphide. On heating, the excess Sulphur is evaporated leaving dark red substance. It is considered as panacea for all diseases.

First, in the Egyptian writings and then in the Greek literature, we find India as the land of gold and precious stones, and all were coming to and searching route to India⁷. Hatshepsut dispatched five great galleys of thirty rowers to Punt from Kossier in 1493 BCE⁸. But, we know that gold was never produced extensively in India. Therefore, the availability of gold as described by others as early in 1493 BCE is intriguing. As the

⁷ Wilson, *Essays on Sanskrit Literature*, Vol.I, London, 1864.

⁸ Alexander Del Mar, *Indian Marks Upon Early Egypt*, in Indian Review, Madras, January, 1908, pp.4-8.

Siddhas wanted mercury for their experiments, they very often went to other countries, particularly to China. The details are tabulated as follows:

Name	Meaning	Origin / sojourn to	Samadhi at	Period	Contemporaries
Kalanginathar	A sage having body made of air	China	China / Kanchamalai, Kanchipuram	c. 8 th cent. CE	Disciple of Tirumular. Bogar
Jamadagni					
Tirunakkiyamuni		China		c. 7 th cent. CE	
Bogar		China		c. 6 th cent. CE	
Cattaimuni		China		c. 5 th cent. CE	Bogar
Punaikkannar	A sage with the eyes of cat or having cat like eyes	Egypt		c. 3 th cent. CE	
Ramadeva or Yakobu	Ramadeva went to Mecca to meet Mohammed and entombed there. Resurrected and returned to India and again entombed.	Arabia	One at Arabia and another at Caturagiri	c. 6 th – 7 th centuries. CE	Prophet Mohammed (570-632 CE)

It is well known that the Siddha literature is replete with methods and techniques of converting lead to silver, silver to brass, brass to gold and so on with the herbal extracts and mercury. Mercury is characteristically mentioned as padarasam or padaradham in Tamil. Padam is the four rigorous religious rites of Saivism and they are cariyai, kriyai, yogam and Jnanam. Therefore, padarasam could be construed as the essence, result or finality of such rites. Rasavadham or rasavadha viddhai, the technique of conversion of base elements into gold with mercury or simply the art of gold making is one of the traditional 64 arts of India. The conversion of Mercury into mani, a diamond like stone, which prevents all diseases when worn is also mentioned. The characterization of padarasa / mercury with agni / fire with colours yellow, red and black coincides with the heating of yellow mercuric oxide on heating turning to red, then dark red and finally black. Rasa bashpam = Calcinated mercury is very often used to cure many diseases.

That silver (47) can be obtained from Zinc (29) or Copper (30) and Gold (79) from Mercury (80), proves that the ancients in general, and Indians in particular, had some sort of classification of metals/elements similar to periodic table (the atomic numbers are given in the brackets). Therefore, the usage of mercury in India in the earlier period may not be ruled out.

The Tradition of Siddhas and their Alchemy: The Siddhas of South India deal with rasavadam and kayakalpam, medicinal preparations made of mercury and herbs

respectively used to rejuvenate the aging body or keeping the body without aging, which has been unique in the Siddha literature. Tirumular, whose date is mentioned at two extremes - one dating back to 1000-500 BCE and the other to 100-300 CE. In any case, it is evident that his tradition is the ancient in India, which specifically talks about the elixir for human beings, if they follow certain code of conduct accompanied with disciplined life, strict food and practice of yoga. In Sangam period (c.300 BCE), one poet was there whose hair was never grayed or whitened ie, it was black, even when he was an old man. The Siddhas have contacts with many countries and their impact was significant. As many Siddhas used to sojourn to other countries, either they settled there itself or returned to India after many years. Thus, the middle-eastern literature is hagiographed with legends of such Siddhas. As they are Indians and Hindus, the westerners did not want to give prominence and hence kept dark about their details. But, deeper studies reveal the fact, as the contending authors of such works are not traceable to reality and the works attributed to them turned out to be forgeries and so on.

The Myth of Elixir of life / Philosopher's Stone etc: The happenings of birth and death have haunted humanity to research into such aspects and find out a way to get away from them. The attempts of liberation from birth lead to philosophy with higher theology - cyclic nature of birth, and death, reincarnation, transmigration of soul, resurrection. The efforts to get freedom from death proceed to inventions of keeping body from aging, control of senses, taking medicine to that effect, secret preparation of medicines by selected groups, preserving such secrets in the quatrain poems under the masquerade of keywords.

The Philosopher Stone is a stone which could convert base elements into gold. The myths of elixir in Indian tradition are Lunar Elixir- the Soma juice and the Solar Elixir-amrita (nectar). The preparation of Soma juice has been elaborately described in Rigveda. The Amrita / ambrosia / Quintessence / nectar is obtained when the ocean is churned with Vasuki serpent with Meru as staff. Thus, in Indian tradition, death prevention processes related to panchabhuta tatva, death or nirvana as the elixir of life, breathing exercise / pranayama, taking medicines like the preparation of herbs or metals, consideration of gold for longevity of life etc are found.

Mercury is represented as three-headed and called Tricephalus, Triplex, as one with the Sun and Venus. In alchemy, mercury is the radical Moist Principle, Primitive or Elementary Water, containing the Seed of the Universe, fecundated by the Solar Fires. This is similar to the description given about Shiva comparing with Prarada, rasa etc.

Most of the travellers, merchants and others who wanted to come to or came to India arrived India only for the purpose of acquiring secret of alchemy, preparations and connected works of alchemy. This vouchsafed by their writings Fa-Hian, Yuan-Suang, Alberuni, Francois Bernier, Marco Polo and others. The hoards of the Greek, Arabs, Chinese and then European - missionaries, scholars and others sojourned to India to learn the art. The Greek writings are filled with such narrations on Indian wealth and health.

"There are evidences that the first adventurers from the orient to Egypt by sea from Ceylon by way of Arabia and Abyssinia or Ethiopia. Both Diodorus and Arrian regarded the Arabians of the coasts as Indians. The early history of Ethiopians contains many reminiscences of India. Egyptian epigraphy points to the land of Punt as the earliest landing place of the gold seekers; "punt" being an Indian word for gold. The land of Punt was on the Red Sea near Bab- el-Mandeb. Following the Cingalese from Orissa and the Bay of Bengal, the later with Tibetan myths and place names; In short all of the coast tribes of Bharatvarsa."⁹

But, why scholars ignore these the facts and assert differently in writings on India is intriguing. Therefore, such methods are also to be scrutinized.

Systematic Attempts to suppress the facts of Indian Alchemy / Chemistry: The methodology involves either one or more of the following:

1. Vigorous collection of charts, formulae, manuscripts and works of the ancient India.
2. Misinterpretation of data and facts.
3. Destruction of manuscripts/ works with or without translation into their respective languages.
4. Circulating such works as their originals.
5. Even where origins are mysterious or doubtful or definitely traceable to India, denying the credit by not recording facts.
6. Even after knowing the truth giving credit to plagiarists and copyists.
7. Denial of archaeological evidences.

The visits of foreigners and missionaries viz., the Greeks, Buddhists, Arabs / Muslims, and Christians have been well recorded in the history. The Greeks and Arabs had taken away many works and scientists along with them. Alexander while returning back forcefully took away Indian scholars and so also Arab / Muslim invaders and intruders.

Misinterpretation of data and facts: The Britannia Encyclopedia characteristically mentions that, "***the possibility exists that the Indians acquired the idea from the Greeks, but it could have been the other way around***", adding that, "***It is also possible that the alchemy of medicine and immortality came to India from China or vice versa*** (Vol.25, p.78). Here, the possibilities are-

1. The Indians acquired the idea (of alchemy) from the Greeks.
2. **The Greeks could have acquired the idea from the Indians.**
3. The alchemy of medicine and immortality came to India from China.

⁹ Punt is considered as a place in India from where gold and other valuable gems were exported to Egypt. In fact, Punt is also considered as equivalent word for gold. These items were reaching Egypt via the land route from Hadramat and Aden.

Paul Hermann, **Conquest by Man**, Harper & Brothers, USA, 1954, pp.60-61, 56.

4. The alchemy of medicine and immortality came to China from India.

Therefore, the points 2 and 4 expose the truth, because of the antiquity of India. Sir William Matthew Flinders Petrie, Richard Garbe, Edward Pockoke, Schrader, Hopkins and others have shown that Pythagorus (c.550 BCE), Plato (427-347 BCE), Appolonius and others had visited India and other scholars like Socrates (469-399 BCE) were influenced by the Indian thought. No doubt, the Chinese were also equally ancient as that of India.

Decoding hagiographical accounts: Indologists, orientalist and Sanskrit scholars are also responsible for certain misinterpretations. In alchemic works, particularly, literature dealing with Tantras or literature couched with such language are not properly studied decoding and deciphering the keywords in scientific perspective. For example, the mixing of Shiva's semen with the Parvathi's mensural fluid is ignored as bad or unorthodox. While Sanskrit scholars are bewildered, the western and other scholars have blown into proportions with malice and bias to tarnish the believers. But, actually, the mixing of Mercury with Sulphur is implied here. Similarly, the usage of Parvathi's mensural fluid and blood is repeatedly mentioned in different processes. The actual implied meaning as to whether it denotes addition or mixing of sulphur or any other element with other elements to produce compounds is to be studied.

Destruction of manuscripts/works with or without translation into their respective languages:

The person destroyed/burned destroyed/	The place / city where destroyed / buried	Date period /	How many books / scrolls / works destroyed and subject	References / authority / quoted by
Diocletian	Esoteric works of the Egyptians	296 CE	Burned down books together with works on why concerning alchemical properties of gold and silver	He ordered for a search and burning of such books in Egypt W Godwin has recorded the incident Quoted by HP Blavesky vol. V
Cesar	Alexandria		7,00,000 scrolls	
Leo Isaurus	Constantinople		3,00,000 scrolls	
Muslims	Taxila, alanda and other Universities	8 th century	Millions of manuscripts, charts, tables etc.	Well recorded

Alexandria is often described as the factory of religions¹⁰ i.e, where most of the world's leading religionists gathered and worked together or was made to do so. Indians were there and their contribution is significant. But with the destruction of Alexandrian library several times, it is not known nowadays.

¹⁰ H.G. Wells, **The Outline of History**, Cassell and company, UK, 1932, p.381.

Circulating such works as their originals: Though, it is well known that Indian scientific works were translated into Arabic, unfortunately, the Indian sources are not only acknowledged, but the translated works were circulated as original works. Even where origins are mysterious or doubtful or definitely traceable to India, denying the credit by not recording facts is noticed.

Denial of archaeological evidences: The evidences of Indus Valley Civilization (4500 -3500 BCE), Dwaraka (2500-1500 BCE), Taxila (1000-500 BCE) and other excavations are not studied in consonance with the scientific development. The copper cast statue of dancing girl, dyed fabrics, coloured and fired pottery and ceramic ware, glass ware and beads, gold ornaments etc could not have been produced by the Indians without any chemistry and chemical technology. The iron anchor, seals, carved statutes (where tensile steel tools must have been used) of Dwaraka excavation could not have been produced without any such knowledge. Surgical instruments, tools of blacksmith and carpenter, different types of swords, daggers and spears obtained at Taxila could not have been manufactured without the knowledge of material science and processes, The examples are only illustrative and not exhaustive.

The Riddle of Jabir-Giber Writings: Many books with names and style of The Book of the King, The Book of Mildness, The Book of Weight, The Book of Mercury, The Book of 70, The Book of 1200-were attributed to one Arabic writer Jabir ibn Hayyan- Geber / Giber / Jiber - the latinized form of his name. They contain methods about the artificial production of gold with the aid of the ferment of ferment also called elixir of elixir the Arabic "*al iksir*". Even up to 1678, Summa Perfectionis Magisterini (The sum of Perfection of the Perfect Magistry), Liber Fornacum (Book of Furnaces) and De Inventionis Veritatis (The Invention of Verity) were published. Later Marcellin Berthelot (1826-1907), E.F. Holmyard, Julius Ruska¹¹, Paul Kraus and others conclusively proved that all the Geber writings were forgeries and imitations copied from unknown sources probably after 900 CE and attributed to Jabir ibn Hayyan. The available writings have been dated to 13-14 centuries. But, the authenticity of the author and works could not be established conclusively.

Jabir's travels to India etc: While Jabir mostly settled in Iraq and Syria, he has sometimes referred to his travels to India and Egypt¹². He was in the north India, Himalayan area and Tibet¹³. He was interacting with the practitioners of “Mantra-tantra-

¹¹ Duke Julius of Brunswick roasted Marie Zeiger alive in 1595 for he failed to make gold. Queen Elizabeth of England imprisoned Cornelius de Lannoy for life in the Tower. The king of Prussia hanged Caetano in 1709. Frederick of Wirzburg had a special gallows for hanging alchemists exclusively. James Price or Higginbottom of Royal Society committed suicide, when he was asked to demonstrate how he could make silver into gold.

¹² Montazeritabar, Marziyehsadat, and Zaiqing Fang. "**The place of study of Nature in Jabir Ibn Hayyan's classification of science.**" *Advances in Historical Studies* 9.3 (2020): 85-91.

¹³ Walter, Michael. "**Jabir, the Buddhist Yogi: Part one**" *Journal of Indian Philosophy* (1992): 425-438.

yantra." He was often mistaken as "Tbetan monk" by others¹⁴. Jabir ibn Hayyan, also known as Geber in the West, is a figure surrounded by both historical recognition and legendary status, particularly in the realm of alchemy and early chemistry. While he is widely accepted as a historical figure, some aspects of his life and works are shrouded in mystery and embellished with myths and legends¹⁵. Paul Kraus (1904-1944) was a scholar of Islamic studies who dedicated significant research to the Jabirian corpus. Kraus's analysis of the texts led him to believe that the corpus was not the work of one individual but rather a collection of writings produced over time. The texts were likely written no earlier than the 3rd / 9th century and took around a century to be completed.

Al-kaya and Kayakalpam: As the Western and Muslim scholars were not familiar with Siddhas, they could not find the similarity or, same titles had by the forged books. But, the scholars of south India in general and Tamilnadu in particular can easily recognize that they are the exact titles of the books of Siddhas even available today. Therefore, it is evident that the Indian Siddhas living there in the Middle East later converted to Islam wrote these books. Unwittingly, they mention that the Jabir writing contain **al kaya** to denote alkali, sagimen vitri to carbonate of soda, tutia to Copper sulphate, kuhl to gray antimony ore etc¹⁶. They are nothing but Hindu equivalent of kayam = the body, **sajji matti, tuttanag** etc The so-called al iksir is nothing but **kayakalpam**, chemical mixture that keeps human body young without aging. Here, Georg Lockemann miserably tried to derive iksir / elixir from the Greek **xerion** (desiccative / preservative powder) or Arabic **Imam** (leader) without understanding the meaning and significance or to suppress the fact that it was originated from India. In fact, he never mentions India in his book. The titles, the subject matter dealt with, the arrangement of topics etc., clearly point out that they must have been translated from the Indian Siddha works. In fact, the translation of Indian science books started in the Abbasid period 8th century.

The Myth of Medieval period: The Western - both of Middle Eastern and Euro-centric biased writers purposely dub the period 12th to 16th centuries as medieval, as if there was no progress, achievement or advanced society existed during the period. But, factually, the highest state of culture and civilization was existing in the Eastern Hemisphere that was purely Indian based and derived with continuance from the past. Though, such scholars acknowledge the contribution of the Arabs, who derived their knowledge from the Hindus, they totally black out the contribution of Indians / Hindus. As their sole aim has been directed in that angle, the origin and meaning of many terms and expressions have also been explained away without any historical basis.

Chemistry or Rasayana sastra?: Chemistry as such developed only in the 17th century and the name got popularized thereafter as has been accepted by the western scholars.

¹⁴ Walter, Michael. "**Jabir, the Buddhist Yogi: Part Two" Winds" and Immortality.**" *Journal of Indian philosophy* 24.2 (1996): 145-164.

¹⁵ Holmyard, Eric John. "**Jābir ibn Hayyān.**" *Proceedings of the Royal Society of Medicine* 16.Sect_Hist_Med (1923): 46-57.

¹⁶ Georg Lockemann, opt. cit, p. 31.

But, Rasayana sastra has been in use in India since Vedic period and IVC, Though the available texts on Rasayana dated to 12th century, the subject was established before as proved and corroborated by the archaeological evidences.

The history of Chemistry and chemical technology is dated back to Vedic period with material evidences available at different places.

Work	Author	Period	
Vedic texts	Different authors	8000 BCE	evidence Ceramic wares, designs drawn on the ware with paints
		4000 BCE	The cast head of a priest recovered by Harry Hicks and analyzed by Dr. Robert Anderson and dated to 3700 BCE be, it was cast around that period.
	Do	3000 BCE	Copper implements
	Do	2000 BCE	Iron implements
	Do	4 th cent. BCE or 5 th cent.CE	Delhi iron pillar, Iron girders of Puri
Sul Shoo, Vol. XXXIV	A Chinese book	589-618 CE	Nagarjuna was mentioned as Loong Shoo Le, Dragon tree, the exact equivalent of Hindu name
A work on chemistry	Vrinda	c. 900 CE	
	Chakrapani	c.1600 CE	
Rasaratnaka	Nagarjuna	8 th or 9 th cent.CE	
Rasamava		1000-1300 CE	
Rasarana-samuccaya		8 th to 12 th centuries	
Madanapala - nighantu		c.1874 CE	Zinc was mentioned as separatemetal

Indian alchemy is different from alchemy of others: Indian alchemy dealing with transmutation of elements never dealt with producing elixir, philosopher's stone, materia prima. Indian alchemy tried to increase the longevity or make man up to 100 years. Indian alchemist or philosopher knows very well that born man has to die and his body decomposes or when consigned to fire divides into the respective five elements and unites with nature according to panchabhutatatva. Therefore, they clearly suggested and devised methods of yoga, pranayama, disciplined food and life etc., that by controlling the human equivalent of five elements, every man can live up to his prescribed age. It is to be noted clearly that Indian alchemists were never persecuted and punished by the rulers or others as happened in the west. But, the alchemists of the west were burnt to death, hanged, killed and so on¹⁷. Moreover, the so called medieval alchemy of the west was used by the Church to forge documents, manufacture relics and historisize many myths related to Christianity. That is why, we find, even famous

¹⁷ The persecution of the scientists by the church is also well-known to be repeated here. However, in India such things never happened.

scientists were performing alchemical experiments at one side and writing books justifying the Christian dogmas.

Why Chemistry and Chemical Technology should have existed in a Culture or Civilization? The necessity, codification, systematization and application of the subject prove the existence of it. Such practice, function and application are proved by the used elements, compounds, formulations, laboratories, factories and so on supported by the material evidences. Later, they are reflected in the in didactic, technical or even in nomadic literature. Conceptualization of a subject affirms the high philosophical status attained by the codifiers and formulators. Material evidences testify the maximum usage. Thus, we find well manufactured ceramic wares with fine decorations with colours, Copper and Iron implements, gold and silver ornaments, Glass beads, dyed fabrics, cast articles, besides a host of religious goods in a society corroborate the actual status. Sudden material evidences without literary evidences prove the borrowed technology. Vast literature without material evidences does not prove the non-existence of such knowledge.

Conclusion: If anybody refers to dictionaries and encyclopedias of 100 to 250 years back (available in libraries and private collections), one can find many items produced out of chemical processes with adjective India and Indian. They also indicate that Ind, Hind, Hindsa etc., of Greek, Persian and Arabic words show that origin of such items are from India. Some of them are listed for ready reference as follows:

Indian sword = characteristic swords produced in India

Indian steel = characteristically known as Woortz

Indiaman = ship engaged in Indian trade India paper soft absorbent kind imported from China, used for proofs of engravings.

- ⊙ India proof = proof on India paper
- ⊙ Oxford India paper = thin tough opaque printing paper
- ⊙ India rubber = coagulated juice of certain plants, used for tires, rubbing out pencil marks Indian com = maize
- ⊙ Indian hemp = cannabis, a narcotics.
- ⊙ Indian file = single file
- ⊙ Indian ink = black pigment made in China and Japan
- ⊙ Indian black = a black colour of granites peculiar to Indian origin
- ⊙ Indian meal = made from Indian corn
- ⊙ Indian weed = tobacco
- ⊙ Indigo = (in Greek) a dye manufactured and exported from India
- ⊙ Hindsa = number system and numbers from India.

These items had been in use for thousands of years and thus, they are indicated as so. Therefore, the underestimation or denial of credit to India in the contribution of chemical sciences is not correct.

The western conceptual implication of the expression "from alchemy to chemistry" is the progress occurred in the field, whereas, the expression "from Rasayana to Rasavada" implies exactly the opposite - retrogression, recession and decline. In spite of external aggression and internal restrictions imposed during the alien rules, the traditional chemistry in all fields thrived, occupied and continued for development in all fields. This is proved in the food habits, mode of dress, hygienic methods, agricultural system, nature based health procedure, religious rituals and so on even today. That is why progressive and advanced nations want to patent turmeric, neem and so on with all their advanced chemical formulae, products and technology. Therefore, Indian chemical methods should be properly studied, analyzed and applied immediately.

Will Durant wrote in The Story of Civilization I: Our Oriental Heritage:

"Something has been said about the chemical excellence of cast iron in ancient India, and about the high industrial development of the Gupta times, when India was looked to, even by Imperial Rome, as the most skilled of the nations in such chemical industries as dyeing, tanning, soap-making, glass and cement... By the sixth century the Hindus were far ahead of Europe in industrial chemistry; they were masters of calcinations, distillation, sublimation, steaming, fixation, the production of light without heat, the mixing of anesthetic and soporific powders, and the preparation of metallic salts, compounds and alloys. The tempering of steel was brought in ancient India to a perfection unknown in Europe till our own times; King Porus is said to have selected, as a specially valuable gift from Alexander, not gold or silver, but thirty pounds of steel. The Moslems took much of this Hindu chemical science and industry to the Near East and Europe; the secret of manufacturing "Damascus" blades, for example, was taken by the Arabs from the Persians, and by the Persians from India."